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Research Article

Afrotropical *Atrichops* Verrall (Diptera, Athericidae) with description of a new species

Burgert S. Muller[1,2], Vaughn R. Swart[2], Louwrens P. Snyman[3]

1 *Department Terrestrial Invertebrates, National Museum, 36 Aliwal Street, Bloemfontein, 9301, South Africa*
2 *Department Zoology & Entomology, University of the Free State, P.O. Box 339, Bloemfontein, 9300, South Africa*
3 *Invertebrate Zoology, Royal Alberta Museum, 9810 103A Avenue NW, Edmonton, Alberta, T5J 0G2, Canada*
Corresponding author: Burgert S. Muller (burgert.muller@nasmus.co.za)

Abstract

Atrichops Verrall, 1909 of the Afrotropical Region are revised, and *Atherix adamastor* Stuckenberg, 1960, previously unplaced, is transferred to *Atrichops* based on morphological characters and feeding ecology. A new South African species, *A. intermedius* **sp. nov.** is also described from Mpumalanga Province.

Key words: haematophagy, new species, taxonomy, water snipe flies

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Introduction

Atrichops Verrall, 1909 is a haematophagous genus of athericine water snipe flies. Females of the genus are all known to feed on frogs (Nagatomi 1964). Presently there are 11 extant species of *Atrichops*, and one fossil species. Yang et al. (2016) most recently described three new species from China. Thomas and Gagneur (1982) described the first species of African *Atrichops*, *A. numidicus* from Algeria. Two years later (Nagatomi 1984b) described the first Afrotropical species *A. stuckenbergi* Nagatomi, 1984 from Kenya.

Note that there are at present five *incertae sedis* species of Athericidae known from South Africa (Stuckenberg 1980), previously placed in *Atherix*, and frequently still referred to as such. One of these five, *Atherix adamastor* Stuckenberg, 1960 has been informally placed in *Atrichops* by Picker et al. (2004: 274), and is also listed as such on data aggregators. The informal classification of this species can be largely attributed to Brian Stuckenberg. In his contributions to the "Field Guide to Insects of South Africa" by Picker et al. (2004), he categorised the species as an *Atrichops* when providing information on Athericidae. However, it is important to note that no formal taxonomic treatment or revision has been proposed for this species until the publication of this paper. Woodley (2017: 887) provides an identification key to the current Afrotropical genera of the family. We describe a new species *A. intermedius* sp. nov., which shares affinities with both *A. stuckenbergi* and *A. adamastor* comb. nov., from

Mpumalanga Province, South Africa. A key to these three species of Afrotropical *Atrichops* is also provided. A discussion about the apparent habitat and distribution is provided.

Materials and methods

Preparation methods

Morphological terminology follows that of Cumming and Wood (2017). Terminalia were macerated in heated 10% KOH for approximately 20 minutes or until clear, and examined using a Novel compound microscope with an attached Canon 850D DSLR camera. The same camera, with a 105 mm lens and extension tubes, was used for habitus photos of specimens. Specimen photos were stacked using Helicon Focus 7. Images and plates were prepared using Adobe Photoshop CC 2023 and Adobe Illustrator CC 2023. The species distribution map (Fig. 40) was generated using QGIS 3.28.6 and Africa Terrestrial Ecosystems (Sayre 2023).

Collections

The following collection codens are used:

BMSA National Museum, Bloemfontein, South Africa
CAS California Academy of Sciences, San Francisco, U.S.A.
ICIPE International Centre of Insect Physiology and Ecology, Nairobi, Kenya
MZLU Lund University, Entomology collections, Lund, Sweden
NMSA KwaZulu-Natal Museum, Pietermaritzburg, South Africa
OMNH Osaka Museum of Natural History, Osaka, Japan
SAMC Iziko South African Museum, Cape Town, South Africa

Any additions to materials examined are placed within square-brackets.

Results

Key to species of Afrotropical *Atrichops* Verrall

1 ♂ eyes appearing holoptic (Fig. 6), ♀ frons black shiny, with apex silver-white pruinose just above antennae (Fig. 12), face and clypeus with same silver-white pruinosity; ♂♀ eyes with only some sparse ommatrichia; proepimeral process short and blunt (Figs 21, 24) .... ***A. stuckenbergi* Nagatomi**

– ♂ eyes narrowly dichoptic (e.g. Figs 4, 5), ♀ frons dark brown with at least some sparse pruinosity (e.g. Figs 10, 11), face and clypeus with some yellowish pruinosity; ♂♀ eyes densely covered in ommatrichia, proepimeral process knoblike, not well-developed **2**

2 ♂ frons as wide as anterior ocellus (Fig. 4), fore tibia with numerous conspicuous dorsal and ventral setulae longer than tibial diameter, gonocoxite with narrow base, parameral apodeme long (Fig. 31); ♀ face and clypeus separated by transverse emargination, but no apparent transverse

line; ♂♀ wing at most with only a slight dark marking over base of discal cell (Figs 25, 26) ..... ***A. adamastor* (Stuckenberg)**

– ♂ frons narrower than anterior ocellus (Fig. 5), fore tibia with sparse, widely spaced setulae at most as long as tibial diameter, gonocoxite with narrow base, parameral apodeme shorter (Fig. 32); ♀ face and clypeus separated by transverse emargination with clearly visible darkened transverse line; ♂♀ wing with apparent dark marking over base and apex of discal cell (Figs 27, 28) ..... ***A. intermedius* sp. nov.**

Taxonomy

Atrichops Verrall, 1909

Atrichops Verrall, 1909: 291. Type-species: *Atherix crassipes* Meigen, 1820, by monotypy.

Atherix (*Heterosuragina*) Nagatomi, 1958: 61. Type-species: *Atherix* (*Heterosuragina*) *fontinalis* Nagatomi, 1958, by original designation; synonymised by Nagatomi (1964: 69).

Diagnosis. *Atrichops* is similar in appearance to *Suragina* Walker, 1859 with elongated legs and hind coxa with a stout apical spine-like projection on its anteroventral surface. It is also haematophagous, with well-developed mandibles. It differs from *Suragina* by having a knob-like proepimeral process (also referred to as a ventrally projecting flap in non-Afrotropical species) (reduced in Afrotropical *Atrichops* species), antennal bases very close together (widely spaced in *Suragina*), face narrower than the frons in female, and tibial spur ratio of 0:1:2 (0:2:2 in *Suragina* – some specimens of *S. bivittata* (Bezzi, 1926) with ratio 1:2:2). *Atrichops* also has a uniform coloured frons, without the characteristic contrasting black and silver-grey of *Suragina*. *Atrichops* can be identified and distinguished from other Afrotropical genera using the generic key in Woodley (2017: 887), which is currently the most up to date key for the family in the Afrotropics.

Atrichops adamastor (Stuckenberg, 1960), comb. nov.

Figs 1, 4, 7, 10, 13, 16, 19, 22, 25, 26, 31, 34, 37

Atherix adamastor Stuckenberg, 1960: 273, fig. 86; Stuckenberg 1980: 313; Nagatomi 1984a: 94.

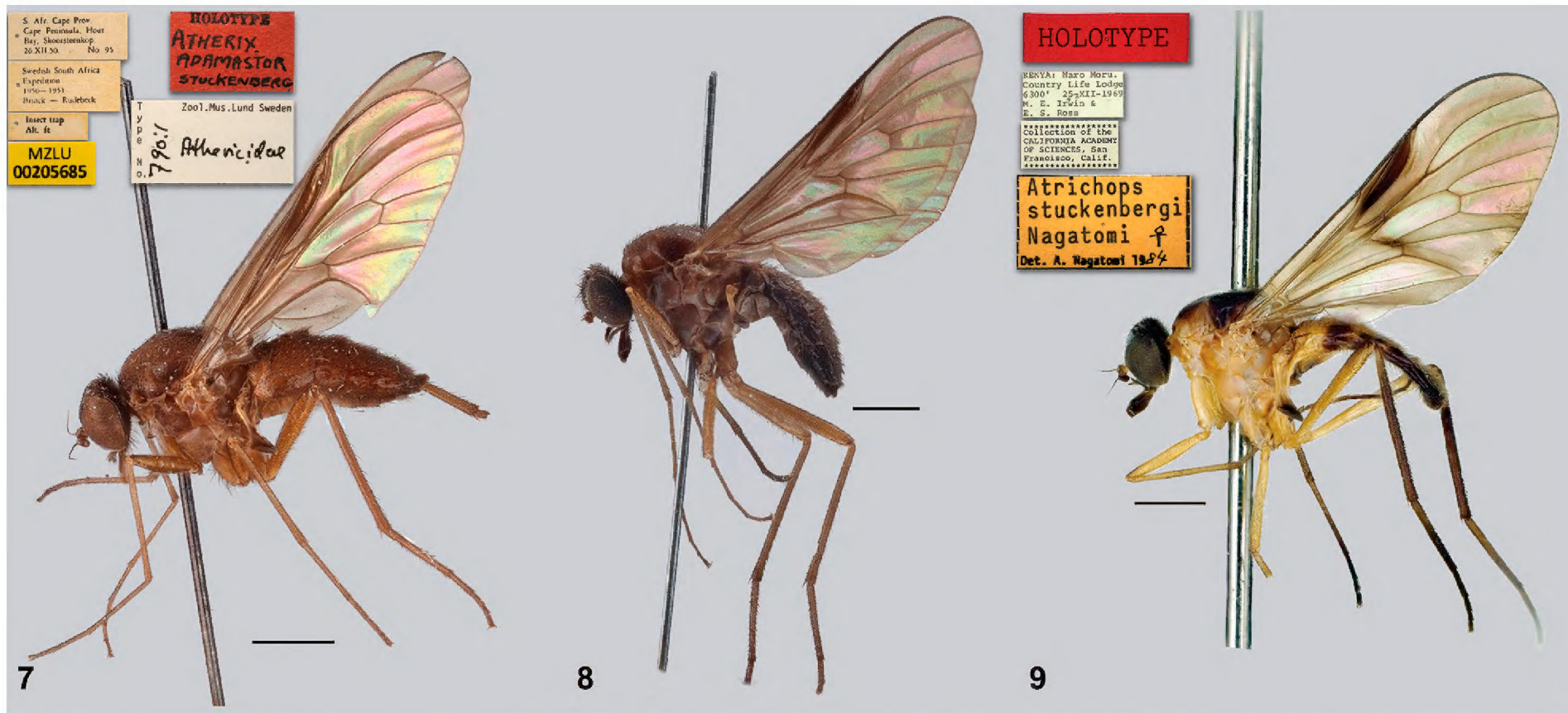
Identity. Stuckenberg (1960: 273) originally described *Atrichops adamastor* in *Atherix* Meigen, noting that its wings are "unlike those of any other South African species". However, it also differs from all other described southern African athericid species by possessing the key diagnostic characters of *Atrichops*, namely a combination of a ventrally projecting knob-like proepimeral process (albeit much reduced), having the face narrower than the frons in female, and antennal bases closely set, nearly touching. It also has wing vein R_{4+5} setulose dorsally, a characteristic only present in *Atrichops*, compared to other Afrotropical genera (see Stuckenberg 2000: 157). The male terminalia are also typical of

Figures 1–6. *Atrichops* spp. ♂ **1–3** lateral habitus **4–6** head anterior view **1** *A. adamastor* (BMSA(D)38908) **2** *A. intermedius* sp. nov. holotype (NMSA-Dip. 81808) **3** *A. stuckenbergi* (BMSA(D) 95848) **4** *A. adamastor* (BMSA(D)38904) **5** *A. intermedius* sp. nov. holotype (NMSA-Dip. 81808) **6** *A. stuckenbergi* (BMSA(D) 95848). Scale bars: 1 mm.

Atrichops species, with the gonostylus inserted medially on the dorsal surface of the gonocoxite (e.g., Figs 31–33), compared to other genera where it is inserted apically. *Atrichops adamastor* has also been observed blood-feeding on frogs (see biology discussion below), a behaviour typical of the genus.

Material examined. Type material examined (based on digital photos, additional data from Brinck and Rudebeck (1955: 77)): ***Holotype*:** South Africa • 1♀; Western Cape Province, Cape Peninsula, Hout Bay, Skoorsteenkop; [34°02.0684'S, 18°22.2420'E]; [300 ft]; 26 Dec. 1950; [Swedish South African Expedition leg.]; No. 95, type no. 00790:1, MZLU00205685 (see Fig. 1) (MZLU).

Additional material examined. South Africa • 2♂10♀; Western Cape Province, Gamkaskloof (Die Hel) at:; 33°21.808'S, 21°37.650'E; 336 m asl; 16–18 Oct. 2012; Kirk-Spriggs, A.H. leg.; Malaise trap in Karoo and valley *Acacia* woodland; (2♂: BMSA(D)38904, 38908; 10♀: BMSA(D)38899, 38900, 38901, 38902, 38903, 38905, 38906, 38907, 38909, 40027).



Figures 7–12. *Atrichops* spp. ♀ **7–9** lateral habitus **10–12** head anterior view **7** *A. adamastor* holotype and specimen labels (MZLU 00205685) **8** *A. intermedius* sp. nov. paratype (NMSA-Dip. 81809) **9** *A. stuckenbergi* (CAS) **10** *A. adamastor* holotype (MZLU 00205685) **11** *A. intermedius* sp. nov. paratype (NMSA-Dip. 81809) **12** *A. stuckenbergi* (BMSA(D)95856). (**7, 10** modified from originals provided by Rune Bygebjerg, MZLU, CC BY-NC 2.0 **9, 12** modified from originals provided by Rikio Matsumoto, Osaka Museum of Natural History). Scale bars: 1 mm.

Diagnosis. *Atrichops adamastor* can easily be distinguished from *A. stuckenbergi*. In *A. adamastor* the ommatrichia densely covers the eye in both sexes, the frons is dark brown, the face is brownish, and the wing is uniformly brown suffused, whereas *A. stuckenbergi* has the eye sparsely covered in ommatrichia, the frons is shiny black, the face has silver-white pruinosity, and its wing brown suffused mainly on apical half, with discal cell and cell m_3 less so (e.g., Fig. 26 vs Fig. 30). It is most similar to *A. intermedius* sp. nov., a South African contemporary (see *A. intermedius* diagnosis).

Remarks. The species was described by Stuckenberg (1960: 273), based only on a single female. The description is sufficient and no re-description is necessary. A description of its previously undescribed (but known) male follows. Mention is made of female characters should they differ from the male.

Figures 13–18. Atrichops spp. ♂♀ dorsal view **13** ♂ *A. adamastor* (BMSA(D)38908) **14** ♂ *A. intermedius* sp. nov. holotype (NMSA-Dip. 81808) **15** ♂ *A. stuckenbergi* (BMSA(D)94158) **16** ♀ *A. adamastor* holotype (MZLU 00205685) **17** ♀ *A. intermedius* sp. nov. paratype (NMSA-Dip. 81809) **18** ♀ *A. stuckenbergi* holotype (CAS). (**16** modified from original provided by Rune Bygebjerg, MZLU, CC BY-NC 2.0; **18** modified from original provided by Rikio Matsumoto, OMNH). Scale bars: 1 mm.

Description. ***Measurements*** (♂ n = 2, ♀ n = 10): Wing span: ♂ 4.8–5.2 mm (avg. 5.0 mm); ♀ 5.0–6.0 mm (avg. 5.4 mm); body length: ♂ 4.6 mm (avg. 4.6 mm); ♀ 3.7–4.9 mm (avg. 4.5 mm); wing span to body length ratio (avg.): ♂ 1.1; ♀ 1.2.

Male. ***Head*** (Fig. 4): Colour brown, with some light yellowish pruinosity on face; eye densely covered in ommatrichia; narrowly dichoptic, ♀ widely dichoptic; ommatidia on lower ½ of eye smaller than upper ½ (♀ ommatidia uniform,

comparatively larger than in ♂); lateral edge of eye with slight indentation, nearly absent in ♀; ocellar tubercle base level with frons, ♀ base with sunken appearance; ocellar tubercle with short dark setulae, vertex dark brown, almost appearing black, with somewhat longer setulae than ocellar tubercle; ocelli similar in size; ocellar tubercle in front of dorsal margin of eye, margin less indented than in ♀; vertex narrower than in ♀; dorsal inner edge of eye surrounding ocellar tubercle without discernible paired dark markings (present in ♀); occiput same dark brown as frons, when viewed at angle appearing shiny blackish; upper occiput with short dark setulae on dorsal margin and on rest of upper surface, lower occiput with erect, long and pale setulae, these continue ventrally on head to before mouthparts, bearing dark ventral setulae; frons dark brown, almost black, somewhat shiny, narrow area above antenna lighter brown; frons at narrowest as wide as anterior ocellus, widening towards antennal base, ♀ frons at least 2× width of ocellar tubercle, narrowing only slightly towards antennal base (Fig. 10); frons with well-developed dark setulae on surface, but only on lateral margins, very similar to ocellar and vertical setulae; ♀ frons more setulose than ♂; face lateral edges bare; gena bare; face light brown, clypeus darker brown, ♀ clypeus orange-brown; clypeus bare; face separated from clypeus by prominent transverse suture, in ♀ separated by transverse emargination, never forming suture; clypeus less prominent than in ♀; face much wider than in ♀, with prominent longitudinal emargination on side of clypeus, giving appearance that face bulges laterally; face and clypeus not visible in profile (visible in ♀); antennal bases close together, almost touching, gap somewhat larger than in ♀; scape brown, dorsally infuscate around setulae; pedicel comparatively darker than scape, dorsal surface infuscate; scape and pedicel setulae dark; 1st flagellomere reniform, appearing almost 2× height of pedicel, concolourous with pedicel, basal margins lighter brown; 2nd flagellomere arista-like, dark brown; scape and pedicel setulae similar in size; palpus dark brown, well-developed, ca 0.5× length of proboscis, with long, dark setulae; proboscis dark brown with orange-brown base.

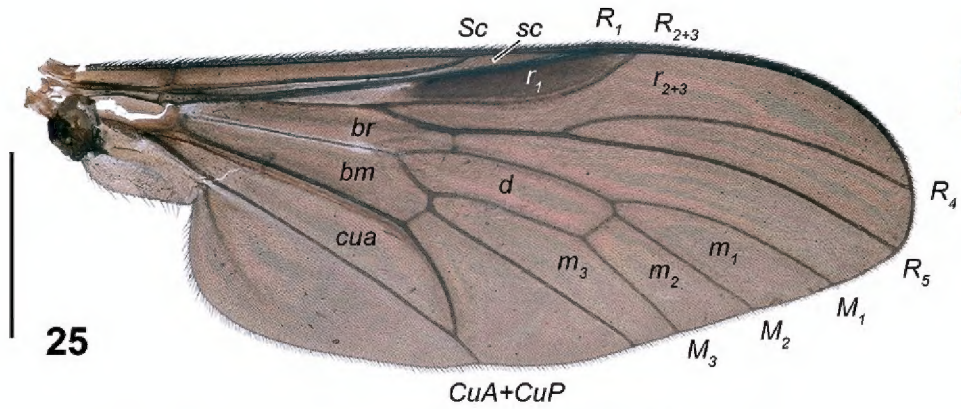
Thorax (Figs 13, 19): Scutum with short dark setulae, posterior setulae longer than anterior setulae; scutellum with well-developed dark setulae; postpronotal lobe lighter brown than scutum, with fine dark setulae; scutum uniformly dark brown; scutellum uniformly dark brown; pleura generally brown in colour, with anepisternum, katepisternum, anatergite and katatergite somewhat darker; proepimeron with reduced flap-like process near anterior edge; notopleuron with well-developed dark setulae; area surrounding posterior spiracle dark brown, postspiracular scale dark brown almost black; proepisternum and pronotum yellow; anterior spiracle bare posteriorly; proepimeron, proepisternum bare, anepisternum with short dark setulae; katatergite with long pale setulae; rest of pleura bare; postmetacoxal bridge narrow.

Legs (Fig. 1): Coxae yellow, anterior surface of mid- and hind coxae brown; fore coxa with short dark setulae on surface, more pronounced apically; mid coxa with long dark setulae on surface, hind coxa with dark setulae on anterior and lateral apical edges, and with well-developed anterior apical point; trochanters with some scattered short dark setulae, trochanters yellow, apical margins with darker markings, more pronounced than in ♀; fore and mid femora, and basal ¼ of hind femur yellow, apical ¾ of hind femur dark brown (♀ with all femora yellow); fore, mid and hind femora with small anterior apical dark mark;

Figures 19–24. *Atrichops* spp. ♂♀ proepimeral process, lateral view **19** ♂ *A. adamastor* (BMSA(D)38904) **20** ♂ *A. intermedius* sp. nov. paratype (NMSA-Dip. 81811) **21** ♂ *A. stuckenbergi* (BMSA(D)94158) **22** ♀ *A. adamastor* (BMSA(D)38899) **23** ♀ *A. intermedius* sp. nov. paratype (NMSA-Dip. 212861) **24** ♀ *A. stuckenbergi* holotype (CAS). (**24** modified from original provided by Rikio Matsumoto, OMNH). Abbreviations: prepm – proepimeral process.

fore, mid and hind tibiae dark brown (♀ with fore and mid tibiae yellow); all tarsi dark brown (♀ with yellow fore and mid tarsi); fore tarsal claws symmetrical, empodium at least 2× size of pulvilli on fore legs; fore femur covered with dark setulae on all surfaces, posteroventral setulae forming row, mid femur with row of longer anteroventral setae and hind femur with similar dark setulae on ventral and dorsal surfaces; hind leg stouter than fore and mid legs; fore tibia and tarsi densely covered with long setulae along dorsal and ventral surfaces, at least as long or longer than width of segments (♀ without long hairs); hind tarsomeres 1.01–1.02 (♂) and 0.87–1.02 (♀) times as long as hind tibia.

Wing (Fig. 25): Suffused brown on entire surface, with much darker pterostigma over area of veins R_1 and R_{2+3} and cell r_1; vein R_{4+5} with setulae dorsally, extending to vein R_5; veins dark brown; cell *br* and discal cell uniform in colour; costa with distinct downward flexure over pterostigma; cell *cua* closed at short distance from wing margin, cell m_3 open, veins M_1, M_2, M_3 present; halter with yellow stalk and dark knob in both sexes and ♀ holotype (Fig. 7). This differs from original description of *A. adamastor* ♀ holotype with Stuckenberg (1960: 274) noting “Halteres with pale yellowish knob.”



Figures 25–30. *Atrichops* spp. ♂♀ wings dorsal view, *A. adamastor*: **25** ♂ (BMSA(D)38904) **26** ♀ (BMSA(D)38904); *A. intermedius* sp. nov.: **27** ♂ paratype (NMSA-Dip. 81811) **28** ♀ paratype (NMSA-Dip. 212861) *A. stuckenbergi*: **29** ♂ (BMSA(D)94161) **30** ♀ (BMSA(D)95861). Abbreviations: *br* – basal radial cell; *bm* – basal medial cell; *cua* – anterior cubital cell; *CuA+CuP* – anterior branch of cubital vein + posterior branch of cubital vein; *d* – discal cell; M_1 – first branch of media; m_1 – first medial cell; M_2 – second branch of media; m_2 – second medial cell; M_3 – third branch of media; m_3 – third medial cell; R_1 – anterior branch of radius; r_1 – first radial cell; R_{2+3} – second branch of radius; r_{2+3} – second radial cell; R_4 – upper branch of third branch of radius; R_5 – lower branch of third branch of radius; Sc – subcostal vein ; sc – subcostal cell. Scale bars: 1 mm.

Abdomen: Dark brown, with anterodorsal margins of tergites 1–3 as well as entirety of sternites 1–5 yellow; tergites and sternites with short dark setulae, longer dark setulae on lateral margins of tergites, as well as long pale setulae on sternites 1–3; tergite 1 without median suture.

Terminalia (Figs 31, 34): Epandrium and cercus dark brown; hypoproct dark brown; epandrium, hypandrium and cercus with dark setulae; gonostylus finger-like with rounded apex; gonocoxite narrowing from middle towards base, apically rounded with long setulae; parameral apodeme long, extending to base of gonocoxite in ventral view; gonocoxal apodeme markedly shorter than gonocoxite.

Female. *Terminalia:* Stuckenberg (1960) did not describe proepimeral process, which is reduced flap-like process (Fig. 22), much as in ♂. Cercus dark brown with dark setulae; genital fork (Fig. 37) with slender distal apodeme, median lobe with deep apical emargination, paired apical lobes with somewhat square appearance, arms each gradually rounded; 3 sclerotised, somewhat oblong, spermathecae.

Distribution. South Africa (Western Cape Province).

Biology. The species was observed and photographed feeding on the Cape River Frog, *Amieta fuscigula* Duméril & Bibron in the Garden Route Botanical Garden, George, South Africa, by Colin Ralston (iNaturalist observation 9344668). While this behaviour has been informally observed before, it is the first published photographic observation of the species exhibiting typical *Atrichops* behaviour. It also emphasizes the importance of citizen science in highlighting species interactions that might otherwise go unrecorded or unnoticed. Although an attempt was made to sample material from the Botanical Garden for study, it was unsuccessful, possibly due to heavy rains earlier in the season.

***Atrichops intermedius* Muller, sp. nov.**
https://zoobank.org/B3B59959-1502-472A-89C2-C21017DE04D1
Figs 2, 5, 8, 11, 14, 17, 20, 23, 27, 28, 32, 35, 38

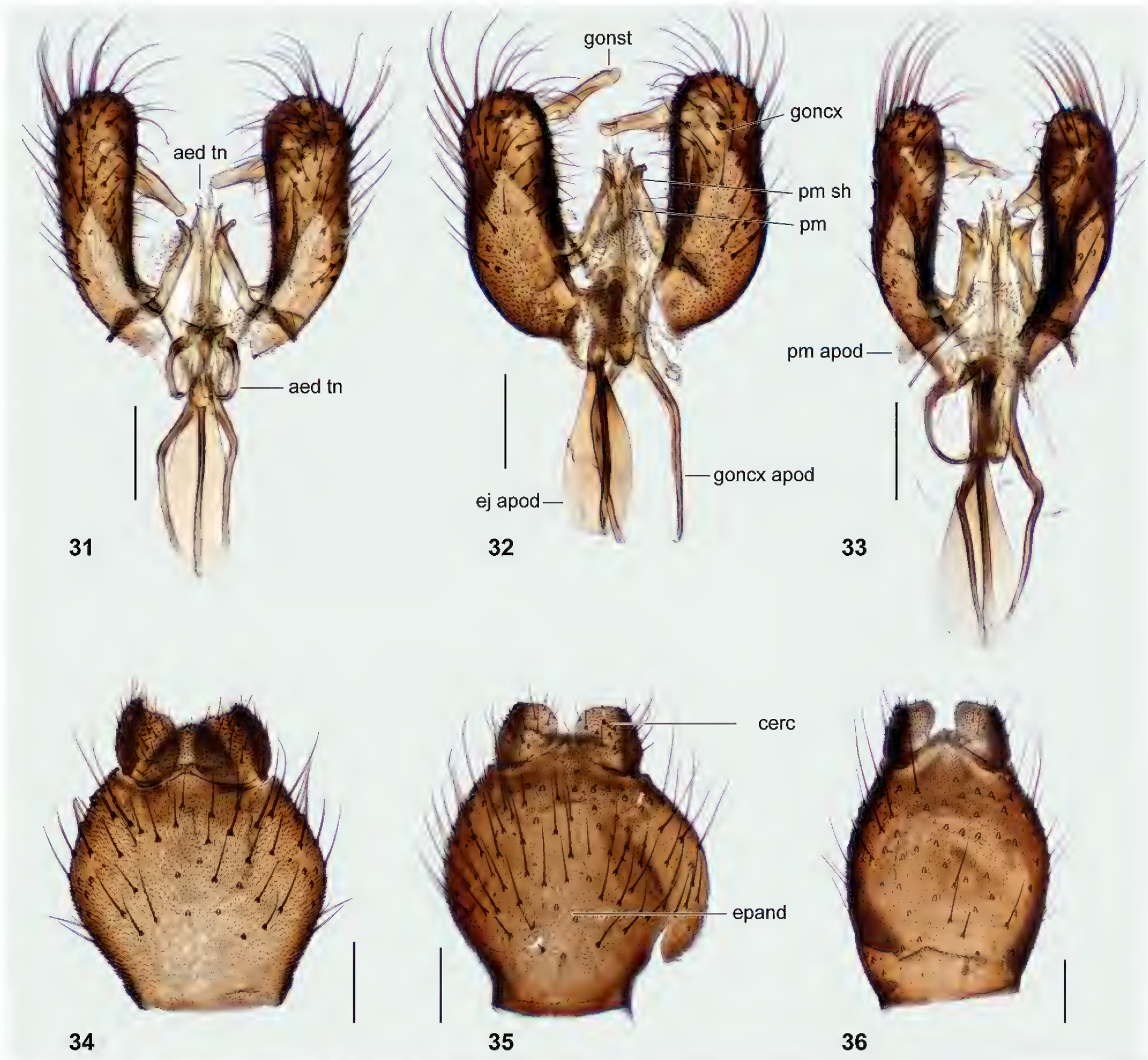
Material examined. Type material: *Holotype*: South Africa • 1♂; Mpumalanga, Gladdespruit River nr Nelspruit [Mbombela] airfield, Transvaal; [25°30.6703'S, 30°54.4575'E]; 2530Db; 2975 ft [907 m asl]; 23 Feb. 1971; Stuckenberg [Stuckenberg, B.R] leg.; streamside bush; (NMSA-DIP 81808) (NMSA).

***Paratypes*:** South Africa • 2♂2♀; Mpumalanga, Gladdespruit River nr Nelspruit [Mbombela] airfield, Transvaal; [25°30.6703'S, 30°54.4575'E]; 2530Db; 2975 ft [907 m asl]; 23 Feb.1971; Stuckenberg [Stuckenberg, B.R] leg.; streamside bush; (2♂ NMSA-DIP 81811, NMSA-DIP 28122; 1♀ NMSA-DIP 81809) (NMSA). 1♀; Mpumalanga, Graskop, [24°55.5480'S, 30°49.7993'E]; 6 Mar. 2000; Picker, M. leg.; (NMSA-DIP 212861) (NMSA).

Diagnosis. This species is most similar to *A. adamastor*. However, it differs from *A. adamastor* in several ways: ♂ more narrowly dichoptic, ♀ with a darkened transverse line between the face and clypeus, ♂ legs nearly unicolorous yellowish compared to both males of *A. adamastor* and *A. stuckenbergi*, which have yellow hind femora and all tibiae and tarsi darker; Additionally, *A. intermedius* has wings with darker brown suffusions over base and apex of the discal cell that are similar to *A. stuckenbergi*, in contrast to *A. adamastor* which has a more uniformly suffused wing. Its gonocoxite is also more rounded and less tapering toward base compared to both *A. adamastor* and *A. stuckenbergi*.

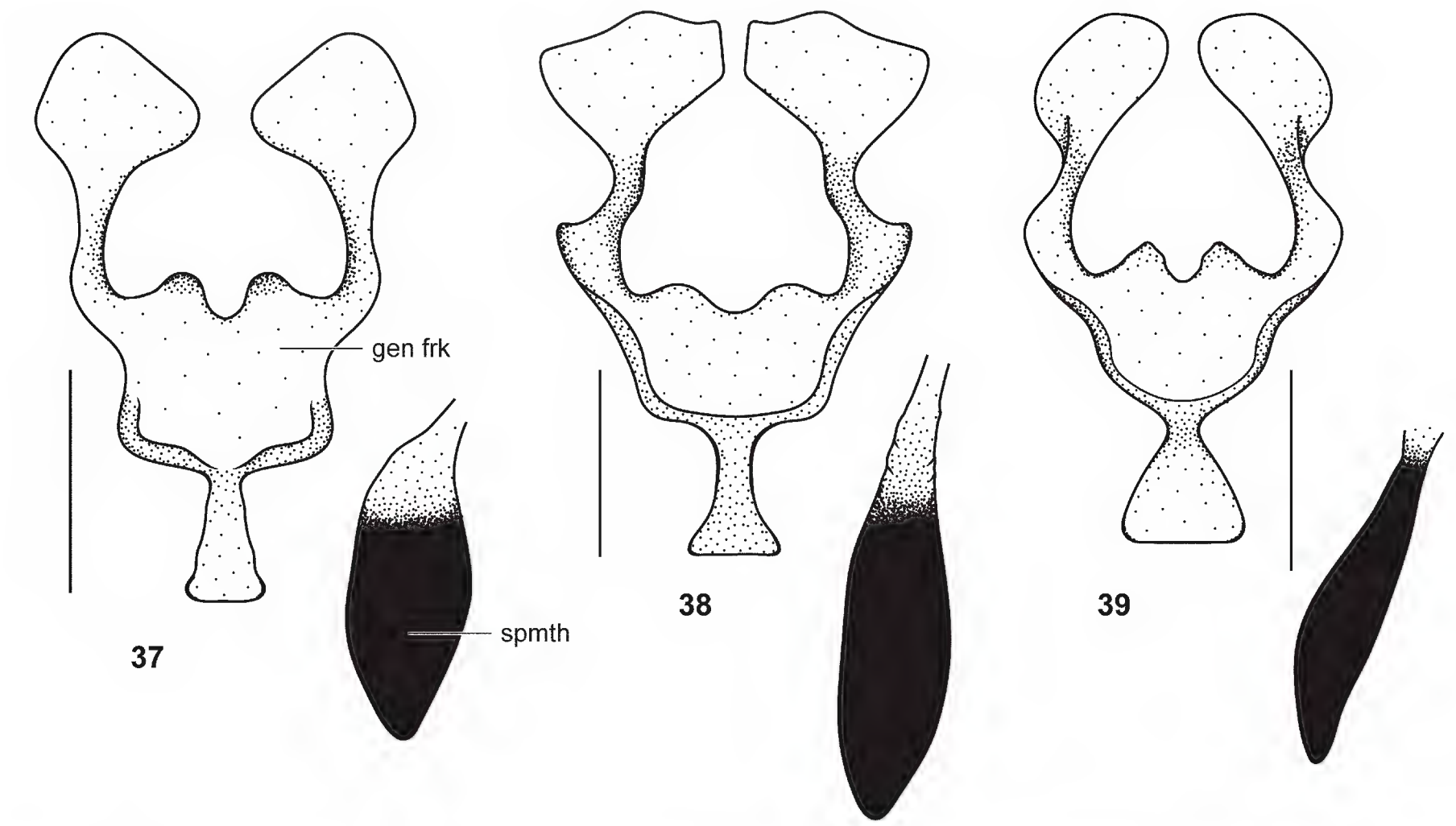
Description. *Measurements* (♂ n = 2, ♀ n = 2): Wing span: ♂ 5.4–5.8 mm (avg. 5.6 mm); ♀ 5.9–6.5 mm (avg. 6.2 mm); body length: ♂ 5.5 mm–6.1 mm (avg. 5.8 mm); ♀ 4.8–5.4 mm (avg. 5.1 mm); wing span to body length ratio (avg.): ♂ 0.96; ♀ 1.2.

Male. *Head* (Fig. 5): Colour dark brown, with some yellowish pruinosity on face; eye densely covered in ommatrichia; narrowly dichoptic; ommatidia on lower ½ of eye smaller than upper ½; lateral edge of eye with indentation (absent in ♀); ocellar tubercle base level with frons, ocellar tubercle with short dark setulae; vertex dark brown, almost appearing black, with markedly longer setulae than ocellar tubercle, similar to that of frons; ocelli similar in size; ocellar tubercle in front of dorsal margin of eye, margin less indented than in ♀; vertex narrower than in ♀; dorsal inner edge of eye, surrounding ocellar tubercle without discernible paired dark markings; occiput same dark brown as frons, when viewed at angle appearing shiny blackish; upper occiput with short dark



Figures 31–36. *Atrichops* spp., 31–33 ♂ terminalia **31** *A. adamastor* (BMSA(D)38904) **32** *A. intermedius* sp. nov. paratype (NMSA-Dip. 81811) **33** *A. stuckenbergi* (BMSA(D) 94160), 34–36 ♂ epandrium and cerci **34** *A. adamastor* (BMSA(D)38904) **35** *A. intermedius* sp. nov. paratype (NMSA-Dip. 81811) **36** *A. stuckenbergi* (BMSA(D) 94160). Abbreviations: aed tn – aedeagal tine; cerc – cercus; ej apod – ejaculatory apodeme; epand – epandrium; goncx – gonocoxite; goncx apod – gonocoxal apodeme; gonst – gonostylus; pm – paramere; pm apod – parameral apodeme; pm sh – parameral sheath.Scale bars: 0.15 mm.

setulae on dorsal margin and on rest of upper surface, lower occiput with erect, long and pale setulae, these continue ventrally on head to before mouthparts bearing dark ventral setulae; frons dark brown, almost black, narrow area above antenna lighter brown; frons at narrowest slightly narrower than anterior ocellus, widening towards antennal base; frons with well-developed dark setulae on surface except for narrow area above antennae, these similar to ocellar and vertical setulae; frons less setulose than ♀; face lateral edges bare; gena bare; face light brown, clypeus darker brown; clypeus bare; face separated from clypeus by prominent, deep, dark transverse suture; clypeus less prominent than in ♀; face much wider than in ♀, with prominent longitudinal emarginations on



Figures 37–39. *Atrichops* spp., ♀ genital fork and spermatheca **37** *A. adamastor* (BMSA(D)38899 **38** *A. intermedius* sp. nov. paratype (NMSA-Dip. 212861) **39** *A. stuckenbergi* (BMSA(D) 95855). Abbreviations: gen fk – genital fork; spmth – spermatheca. Scale bars: 0.15 mm.

sides of clypeus, giving appearance that face bulges laterally; face and clypeus not visible in profile; antennal bases close together, almost touching; scape light-brown, dorsally infuscate around setulae; pedicel comparatively darker than scape, dorsal surface infuscate; scape and pedicel setulae dark; 1st flagellomere reniform; appearing almost 2× the height of pedicel, same colour as pedicel, basal margins lighter brown; 2nd flagellomere arista-like, dark brown; scape and pedicel setulae similar in size, palpus brown, well-developed, ca 0.5× length of proboscis; proboscis comparatively smaller than ♀ proboscis in relation to head; proboscis dark brown with long dark setulae.

Thorax (Figs 14, 20): Scutum with short dark setulae, postsutural setulae longer than presutural setulae; scutellum with well-developed dark setulae; postpronotal lobe lighter brown than scutum, with fine dark setulae; scutum and scutellum uniformly dark brown when viewed dorsally, scutellum similar in colour as anepimeron, anatergite and katatergite when viewed laterally; pleura generally brown in colour, anepimeron, katatergite and anatergite lighter brown than rest of pleura (more pronounced in ♀); proepimeron with reduced knoblike process near anterior edge; notopleuron with well-developed dark setulae; area surrounding posterior spiracle dark brown, postspiracular scale dark brown almost black; proepisternum brown and pronotum yellow; anterior spiracle bare posteriorly; proepimeron and proepisternum bare, anepisternum with short dark setulae; katatergite with long pale setulae; rest of pleura bare; postmetacoxal bridge narrow.

Legs (Fig. 2): Coxae brown; fore coxa with short black setulae on surface, more pronounced apically, mid coxa with long black setulae on surface, hind coxa with black setulae on anterior and lateral apical edges, with well-developed anterior apical point; trochanters brownish yellow with some scattered

short dark setulae; hind trochanter somewhat lighter than rest; apical margins of trochanters with darker markings; fore and mid femora, and basal ¼ of hind femur yellow, apical ¾ of hind femur dark brown; fore, mid and hind femora with small anterior apical dark mark; fore, mid and hind tibiae yellow; tarsi dark brown; fore tarsal claws symmetrical, empodium at least 2× size of pulvilli on fore legs; fore femur covered with dark setulae on all surfaces, posteroventral setulae forming row, mid femur with row of longer anteroventral setae and hind femur with similar dark setulae on ventral and dorsal surfaces; hind leg stouter than fore and mid legs; fore tarsi densely covered with long setulae along dorsal and ventral surfaces, at least as long as width of segment, similar setulae on fore tibia, although much sparser; hind tarsal segments 0.9–1.1 (♂) as long as hind tibia.

Wing (Fig. 27): Suffused brown on entire surface, with much darker pterostigma over area of veins R_1 and R_{2+3} and cell r_1; veins light brown; cell *br* and discal cell darker suffused apically; costa with distinct downward flexure over pterostigma; cell *cua* closed short distance from wing margin, cell m_3 open, veins M_1, M_2, M_3 present; halter with stalk yellow on basal half, gradually darkening apically with dark brown knob.

***Abdomen*:** Brown, with anterodorsal margins of tergites 2–4 brownish yellow; tergites and sternites similar in colour with short black setulae, except sternite 1 lighter in colour; tergites with longer black setulae laterally; long pale setulae on sternites 1–3; tergite 1 without median suture.

***Terminalia*:** Epandrium and cerci dark brown, hypoproct dark brown; epandrium, hypandrium and cercus with dark setulae; gonostylus finger-like, narrowing slightly towards apex, gonocoxite widening from middle towards base, apically rounded with long setulae; parameral apodeme short, not reaching base of gonocoxite in ventral view; gonocoxal apodeme markedly shorter than gonocoxite.

Female. Similar characters as ♂ except for the following:

Head (Fig. 11): Widely dichoptic, ommatidia of similar size, comparatively larger than in ♂; lateral edge of eye without indentation (present in ♂); ocellar tubercle base with sunken appearance; ocellar tubercle with slightly longer setulae than in ♂; dorsal margin of eye more indented than in ♂; vertex wider than in ♂; dorsal inner edge of eye, surrounding ocellar tubercle with paired dark markings; frons at least 2× width of ocellar tubercle, narrowing only slightly towards antennal base; frons more setulose than ♂; face separated from clypeus by transverse emargination with darkened transverse line; clypeus more prominent than in ♂; face and clypeus visible in profile; 1st flagellomere smaller in comparison to pedicel compared to ♂; 2nd flagellomere ca 0.75× length of proboscis; proboscis comparatively larger than ♂ proboscis in relation to head.

Legs (Fig. 8): Trochanters yellow; apical margins of trochanters with darker markings, less pronounced than in ♂; all femora almost entirely yellow, except for small anterior apical dark marking on each femur; tarsi yellow; fore tarsi without prominent long setulae on dorsal and ventral surfaces; hind tarsal segments 0.8–1.0 (♀) times as long as hind tibia.

Wing (Fig. 28): Some specimens with cell *br* and majority of discal cell surface hyaline.

***Abdomen*:** Darker overall colour, similar anterodorsal margin and setation colour, setulae shorter overall.

***Terminalia*:** Cercus dark brown with dark setulae; genital fork (Fig. 38) with distal apodeme slender, median lobe with shallow apical emargination, paired apical lobes with angular appearance, arms each having angular projection; 3 sclerotised, elongated spermathecae.

Etymology. From the Latin "*intermedius*", meaning in the middle, referring to the species known occurrence being roughly between the distributions (Fig. 40) of *A. adamastor* and *A. stuckenbergi*, but also in reference to *A. intermedius* exhibiting a mixture of characteristics found in both the other two Afrotropical species.

Distribution. South Africa (Mpumalanga).

Atrichops stuckenbergi Nagatomi, 1984

Figs 3, 6, 9, 12, 15, 18, 21, 24, 29, 30, 33, 36, 39

Atrichops stuckenbergi Nagatomi 1984b: 21, figs 3, 10.

Material examined. *T*ype material (based on digital photos): *Holotype*: Kenya • 1♀; Naro Moru, Country Life Lodge; [0°09.3224'S, 37°0.7380'E]; 6300 ft; 25 Dec. 1969; Irwin, M.E. & Ross, E.S. leg.; (CAS). ***Paratype*:** 1♀; Naro Moru, Country Life Lodge; [0°09.3224'S, 37°0.7380'E]; 6300 ft; 25 Dec. 1969; Irwin M.E. & Ross, E.S. leg.; (CAS). Material at time of publication is in the Nagatomi collection of OMNH and will be returned to CAS shortly by the curator in charge at OMNH (pers. comm. B. Sinclair)

Additional material examined. Malawi • 5♂; Southern Region; Mulanje Mountain [Mulanje Massif] at:; 15°56.1667'S, 35°31.1982'E; 1061 m asl; 12–14 Oct. 2016, Kirk-Spriggs, A.H. & Muller, B.S. leg.; Malaise trap, stream bed; Miombo woodland; (5♂ BMSA(D) 97872, 97873, 97874, 97875, 97876). 18♂11♀; Zomba Plateau, Kuchawe Trout Farm; 15°21.2315'S, 35°18.0954'E; 1530 m asl; 8–11 Oct. 2016; Kirk-Spriggs, A.H. & Muller, B.S. leg.; Malaise trap, stream, montane evergreen forest; (11♀ BMSA(D)94146, 94147, 94151, 94153, 94154, 94155, 94158, 94162, 94163, 94165, 94171, 94172, 95851; 18♂ BMSA(D)94142, 94143, 94144, 94145, 94148, 94149, 94150, 94152, 94156, 94157, 94159, 94160, 94161, 94164, 94166, 94167, 94168, 94169, 94170). 5♀8♂; Zomba Plateau, William's Falls; 15°20.8392'S, 35°17.9158'E; 1583 m asl; 15–19 Oct. 2016, Kirk-Spriggs, A.H. & Muller, B.S. leg.; Malaise trap, stream, montane evergreen forest; (8♀ BMSA(D) 95850, 95852, 95853, 95855, 95856, 95857, 95858, 95861). 5♂ BMSA(D)95848, 95849, 95854, 95859, 95860). 1♂; Nyasaland, Cholo [Thyolo], [16°4.2204'S, 35°8.178'E], 14 Sept.1917, Wood, R.C. leg.; (1♂ NMSA-Dip. 158775). Kenya • 1♀; Central Province; Mary Mariuki farm, near Nyamindi River; 00°29.5500'S, 37°23.2932'E; 1457 m asl; 2–16 Jun. 2018, Copeland, R. leg.; Malaise trap; (1♀ ICIPE 3773).

Photographic material. (Scharff et al. 2023): Tanzania • 1♂; Uzungwe [Udzungwa] Mts., Mwanihana Forest above Sanje; [07°46.0000'S, 36°49.0000'E]; 1000 m asl; 1 Aug.1981; Stolze, M. & Scharff, N. leg.; Zool. Museum, Copenhagen; (1♂ ZMUC 100826, GBIF ID: 857827875). 1♀; East Usambara Mts., Amani; [05°05.9833'S, 38°37.9834'E]; 1000 m asl; 10 Jul. 1980, Stoltze, M. & Scharff, N. leg.; Zool. Museum, Copenhagen (1♀ ZMUC 100827, GBIF ID: 857829273).

Note. The Tanzanian specimens are only identified as *Atrichops* sp. on GBIF, but agree with the descriptions and appearance of male and female *A. stuckenbergi*.

Diagnosis. *Atrichops stuckenbergi* can be distinguished from the only other two Afrotropical species, *A. adamastor* and *A. intermedius*, by having its eye sparsely covered in ommatrichia, whereas the others have ommatrichia densely covering the eye. It has the frons shiny black, compared to the frons being dark brown in *A. adamastor*. The wings in *Atrichops stuckenbergi* are brown suffused mainly on the apical half, with the discal cell and cell m_3 less so, much like in *A. intermedius*, compared to *A. adamastor* that has uniformly brown suffused wings. *Atrichops stuckenbergi* differs also from both the other species in the shape of its ♂ and ♀ terminalia (Figs 33, 36, 39).

Remarks. The species was described by Nagatomi (1984b), based on two female specimens. The description is sufficient and no re-description is necessary. The specimens from Malawi were compared to the holotype female (digital photographs) and a non-type female from Kenya and all fit Nagatomi's description of *A. stuckenbergi*. Mention is made of female characters below should they differ from the male. A description of the previously unknown male, based on material from Kenya and Malawi, follows.

Description. ***Measurements*** (♂ n = 5, ♀ n = 5): Wing span: ♂ 5.0–5.7 mm (avg. 5.5 mm); ♀ 5.3–6.5 mm (avg. 5.9 mm); body length: ♂ 5.6–6.2 mm (avg. 5.9 mm); ♀ 3.9–5.2 mm (avg. 4.6 mm); wing span to body length ratio (avg.): ♂ 0.9; ♀ 1.3.

Male. ***Head*** (Fig. 6): Colour dark brown, with silver-white pruinosity on face and clypeus (♀ with similar colour, only with somewhat less pruinosity); eye sparsely covered in ommatrichia, difficult to discern; holoptic, ♀ widely dichoptic (Fig. 6); ommatidia on lower ½ to ⅓ of eye smaller than upper area (♀ ommatidia uniform, comparatively larger than in ♂); lateral edge of eye with prominent indentation, almost absent in ♀; ocellar tubercle with base level with frons; ocellar tubercle with long dark setulae (compared to vertex and occipitals), vertex glossy dark brown, almost black, with shorter setulae than ocellar tubercle; ocelli similar in size; ocellar tubercle in front of dorsal margin of eye, eye margin less indented than in ♀; vertex narrower than in ♀; dorsal inner edge of eye touching ocellar tubercle, without discernible paired dark markings (present in ♀); occiput dark brown with some whitish pruinosity; upper occiput with short dark setulae on dorsal margin and on rest of upper surface, lower occiput with erect, long and pale setulae, continuing ventrally on head to before mouthparts bearing dark ventral setulae; frons shiny black, without any setulae, area just above antennae with silver-white pruinosity; frons widening towards antennal base, ♀ frons at least 2× width of ocellar tubercle, narrowing only slightly towards antennal base; frons bare compared to well-developed setulae on ♀ similar to ocellar tubercle and vertex; face lateral edges bare; gena bare; face separated from clypeus by prominent transverse suture, in ♀ separated by transverse emargination, but never forming suture; clypeus less prominent than in ♀; face much wider than in ♀, with prominent longitudinal emarginations on sides of clypeus, almost giving appearance that face bulges laterally; face and clypeus not visible in lateral view, visible in ♀; antennal bases close together, not touching as in ♀, separated by short, dark longitudinal vitta; scape and pedicel orange-yellow, brown dorsally around setulae; scape and pedicel setulae dark; 1st flagellomere reniform, appearing almost 2× height of pedicel, same colour as pedicel, basal margins lighter brown; 2nd flagellomere arista-like, dark brown; scape and pedicel setulae similar in size, palpus dark brown, basally

orange-yellow, well-developed, ca 0.5× length of proboscis, with long dark setulae; proboscis dark brown with orange-brown base.

Thorax (Figs 15, 21): Scutum with short dark setulae, postsutural setulae longer than presutural setulae; scutellum with well-developed dark setulae; scutum and scutellum uniformly dark brown (♀ holotype with scutellum yellow, darker in ♀ specimens from Malawi); pleura generally yellowish brown in colour, with anepisternum, katepisternum, anatergite and katatergite somewhat darker; proepimeron grey-white pruinose, with somewhat reduced knob-like process near anterior edge, not as apparent as in non-Afrotropical species; notopleuron with well-developed dark setulae; area surrounding posterior spiracle yellow, postspiracular scale dark brown, yellow in ♀; pronotum, postpronotal lobe and postalar callus yellow, all with fine dark setulae; anterior spiracle bare posteriorly; proepimeron, proepisternum bare, anepisternum and katatergite with pale setulae; rest of pleura bare; postmetacoxal bridge narrow.

Legs (Fig. 3): Coxae yellow; fore coxa with short dark setulae on surface, more pronounced apically; mid coxa with long dark setulae on surface, hind coxa with dark setulae on anterior and lateral apical edges, with well-developed anterior apical point; trochanters with some scattered short dark setulae, trochanters yellow, apical margins with darker markings, similar to that of ♀; fore, mid and base and apex of hind femora yellow, hind femur with dark brown middle; fore, mid, and hind femora with small anterior apical dark marking; fore and mid tibiae yellow, hind tibia dark brown; all tarsi dark brown (♀ with yellow mid and hind tarsi); fore tarsal claws symmetrical, empodium at least 2× size of pulvilli on fore legs; fore femur covered with dark setulae on all surfaces, posteroventral setulae forming row, mid femur with row of longer anteroventral setae and hind femur with similar dark setulae on ventral and dorsal surfaces; hind leg stouter than fore and mid legs; fore tibia and tarsi densely covered with long hairs along dorsal and ventral surfaces, at least as long or longer than width of segments (♀ with long hairs only on ventral margins of tarsi); hind tarsal segments 0.94–1.01 (♂) and 0.92–1.00 (♀) times as long as hind tibia.

Wing (Fig. 29): Suffused brown on most of apical half, with much darker pterostigma over area of veins R_1 and R_{2+3} and cell r_1, dark band across area near base of discal cell; majority of discal cell and cell *bm* hyaline; cell *cua* closed short distance from margin, cell m_3 open, veins M_1, M_2, M_3 present; vein R_{4+5} with setulae dorsally, extending to vein R_5; veins dark brown, costa with much weaker downward flexure over pterostigma than in ♀; halter with yellow stalk and dark knob.

Abdomen (Fig. 15): Dark brown, tergites 1–3 with anterodorsal margins yellow (t2 almost appearing triangular) (♀ holotype tergites 1–5 with anterodorsal margins yellow, giving triangular shaped appearance), entirety of sternites 1–5 yellow; tergites with short dark setulae, lateral margins with longer black setulae, more so than ♀; pale setulae on sternites 1–5; tergite 1 without median suture.

Terminalia (Figs 33, 36): Epandrium and cercus dark brown, hypoproct dark brown; epandrium, hypandrium and cercus with dark setulae; gonostylus finger-like, narrowing with prominent sinuous curve towards apex, gonocoxite narrowing from middle towards base, apically rounded with long setulae; parameral apodeme elongate, appearing enlarged, reaching base of gonocoxite in ventral view, aedeagal tine enlarged compared to *A. adamastor* and *A. intermedius*; gonocoxal apodeme similar in length to gonocoxite.

Female. ***Terminalia*** cercus dark brown with dark setulae; genital fork (Fig. 39) with distal apodeme enlarged, median lobe with deep apical emargination, paired apical lobes with rounded appearance, arms each rounding gradually; 3 sclerotised, elongated spermathecae.

Distribution. Kenya, Malawi (new record), Tanzania (new record).

Discussion

The three Afrotropical species are currently known from only four countries in Africa (Fig. 40) and inhabit a minimum of three distinct ecosystems, based on Mucina and Rutherford (2006) and Sayre (2023): *A. adamastor* inhabits

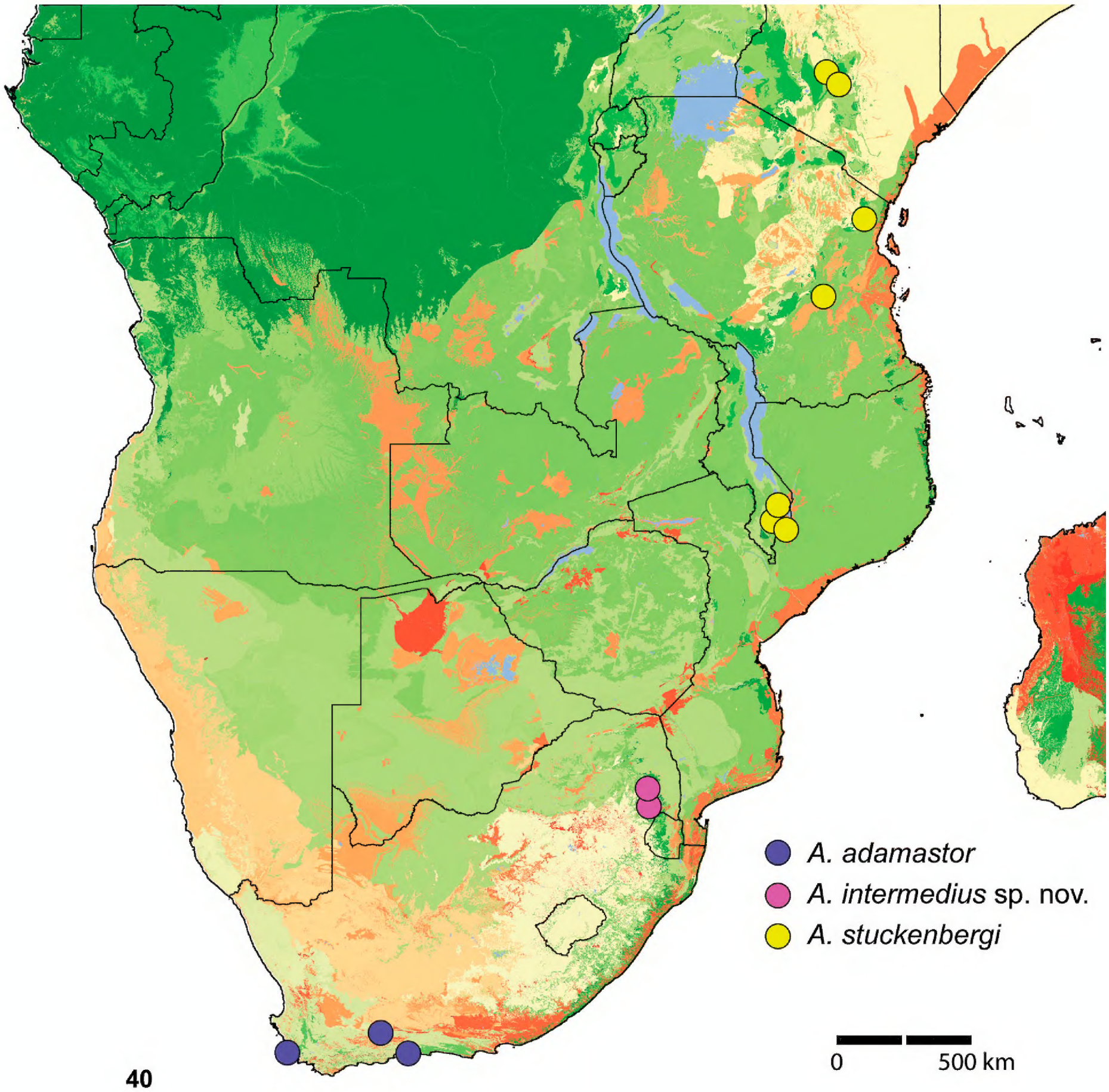


Figure 40. Distribution of *Atrichops* spp. in the Afrotropical Region. Map generated using Africa Terrestrial Ecosystems data (Sayre 2023).

Afromontane forest pockets within the Fynbos biome, but also in adjacent Albany thicket and Succulent Karoo, even in the absence of forest. Brinck and Rudebeck (1955: 77) described the area at 600 ft elevation near the type locality as "dense indigenous wood", with the surroundings as "fairly dry heath with Proteas, and to the east, in a depression with luxuriant vegetation". *Atrichops intermedius* inhabits Savanna and Grassland environments, often featuring similar Afromontane forest pockets. On the other hand, *A. stuckenbergi* has thus far only been found in Afromontane forest of the Eastern Arc Mountains of Kenya and Tanzania, and forests of the Mulanje massif and other mountains in the Southern Region of Malawi. Given the presumed biennial lifecycle of the larvae in the genus, supported by observations of *A. crassipes* by e.g., Gerke and Böttger (2001), it is reasonable to assume that the overall health of water systems and associated environmental conditions in rivers or streams play a crucial role in determining suitable distribution. This includes factors like the availability of prey for larvae and the presence of frog hosts for adult females. Future research into the biology of not only *Atrichops* but also other Athericidae in the Afrotropical Region should consider these aspects. This is especially important in light of the increasing habitat loss in the region, as noted by Chapman et al. (2022). As water snipe flies serve as vital indicators of river health (Dickens and Graham 2002), a better understanding of the group's tolerances is essential. This information can empower relevant stakeholders to make informed decisions in conservation management and planning efforts across Africa.

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Additional information

Conflict of interest

The authors have declared that no competing interests exist.

Ethical statement

BSM confirms ethical clearance, number NMB ECC 2019/1, forming part of project 457 of the National Museum, Bloemfontein, South Africa.

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Author contributions

Muller conceptualised the project with inputs from Swart and Snyman. Muller identified, described and revised the species, and wrote the first draft of the manuscript. Snyman and Swart commented and made additions to the final draft.

Author ORCIDs

Burgert S. Muller https://orcid.org/0000-0002-7304-4050
Vaughn R. Swart https://orcid.org/0000-0001-7905-5298
Louwrens P. Snyman https://orcid.org/0000-0002-5768-7216

Data availability

All of the data that support the findings of this study are available in the main text.

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